

**LIFE HISTORY OF THE DELPHACID PLANTHOPPER
STOBAERA TRICARINATA (SAY) ON WESTERN RAGWEED,
AMBROSIA PSILOSTACHYA DÉCANDOLLE, IN SOUTHERN
CALIFORNIA (HEMIPTERA-HOMOPTERA: DELPHACIDAE)**

N. J. REIMER AND R. D. GOEDEN

Department of Entomology, University of California,
Riverside 92521

Stobaera tricarinata (Say) is a common insect associate of western ragweed, *Ambrosia psilostachya* Decandolle, a native, perennial herb (Compositae) in southern California (Goeden and Ricker, 1976). The life history of this heretofore little-known delphacid planthopper is reported herein.

Taxonomy.—*Stobaera tricarinata* adults were redescribed by Kramer (1973) in his revision of the genus. The egg and nymphs were described by Reimer and Goeden (1981).

Distribution and host plants.—*Stobaera tricarinata* was collected from *A. psilostachya* by the authors and D. W. Ricker at the following locations in southern California: Los Angeles Co.—El Toro, San Juan Capistrano, Yorba Linda; Riverside Co.—Beaumont, Rancho California, Temecula, Wildomar; San Bernardino Co.—Chino, East Highland, Mill Creek; San Diego Co.—Alpine, Encinitas, Jamul, La Mesa, Pala, Poway, Rainbow, Valley Center; Santa Barbara Co.—Carpenteria, Goleta, Santa Barbara; Ventura Co.—Fillmore, Piru, and Ventura.

Kramer (1973) described *tricarinata* as the most commonly encountered species of *Stobaera* in the United States. He recorded this species from 27 states as well as Baja California, Mexico. Other plant records in Kramer (1973) included *A. confertiflora* Decandolle, *A. chamissonis* (Lessing) Greene, and *Helianthus argophyllus* Torrey and Gray. The first 2 records involved only 2 males and 1 female, respectively, probably transients, that Goeden and Ricker (1974, 1975) who supplied these specimens, interpreted as unconfirmed plant associations in their faunistic surveys of these 2 ragweeds. Nymphs and adults also have been collected from *H. annuus* L. ssp. *lenticularis* (Douglas) Cockerell and *Xanthium strumarium* L. throughout southern California by J. H. Hilgendorf, Department of Entomology, University of California, Riverside (pers. comm.). Thus, *S. tricarinata* apparently is selectively, not broadly, oligophagous on host plants belonging to the tribe Heliantheae of the Compositae (Munz and Keck, 1959).

Biology.—Field populations were studied at a 1-ha site located 2 km east

and above Mountain Home Village in Mill Canyon in the San Bernardino Mountains. Laboratory and insectary studies were conducted at the University of California, Riverside, where insectary cultures were maintained on potted *A. psilostachya* at $27 \pm 1^\circ\text{C}$, 45–70% relative humidity, and a 14/10-hr (light/dark) photoperiod.

Egg.—The fusiform-ellipsoidal eggs were inserted singly, blunt end first, into the pith of stems of *A. psilostachya*. The tapered end pointed outward and upward toward the stem apex, penetrated the vascular tissues, and occasionally protruded from an ovipositional slit in the epidermis. Each egg occupied a separate ovipositional cavity. All of 22 eggs observed in the insectary hatched in 15 days.

Nymph.—There are 5 instars. The duration of 27 each, first–fifth instars averaged 3.0 ± 0.02 days, 5.5 ± 0.46 days, 6.5 ± 0.38 days, 8.4 ± 0.8 days, and 11.3 ± 1.4 days, respectively.

After eclosion, the first instars crawled to the undersides of the leaves and fed in the intervenal spaces and smaller veins. The second instars fed in the same leaf areas. However, the third instars fed on the upper surfaces of the leaves as well as on the stems. Most fourth and fifth instars fed on the stems. Moulting occurred in the same areas as feeding.

The apical tibial spur or calcar appears in the second instar (Reimer and Goeden, 1981). This instar and the remaining 3 instars jumped readily by aid of this movable spine.

Adult.—Adults fed in the midribs on the upper surfaces of the leaves and on the more succulent, distal parts of the stems and branches. Both nymphs and adults excreted honeydew. Seventeen individual feedings by 15 adults observed in the insectary lasted an average of 42 ± 3 (range: 15–63) min.

No courtship behavior was observed. Mating was observed only twice. Both instances involved virgin females and occurred late in the afternoon in the insectary. Copulation by 1 pair occurred on a stem; by the other pair, on a cage floor. The pair on the stem lined up vertically with the female facing upward and the male facing downward. The female curved her abdomen dorsally and the male twisted his abdomen laterally until his terminalis contacted the genital opening of the female. This pair remained *in copula* for 8 min; the other pair, for 11 min. While united, the female twisted her abdomen sporadically, while the male remained stationary.

Nine mature females collected in Mill Canyon when dissected had a mean number of 9.9 ± 0.20 (range: 9–11) ovarioles on their right sides and 10.0 ± 0.23 (range: 9–11) ovarioles on their left sides. Twenty ovarioles from these females averaged 3.34 ± 0.43 mm in length. The ovarioles lie dorsal to the digestive tract in the fourth, fifth, and sixth abdominal segments.

The female oviposited in the distal third of a vertical stem while facing upward toward the stem apex. She raised her abdomen and extended her ovipositor so that it was perpendicular to her abdomen and to the plant

surface. She then inserted her ovipositor into the plant tissues until it was fully buried. The ovipositor initially was inserted perpendicularly, but once it entered the plant, it formed a more or less pyriform cavity expanded downward and away from the stem apex. This mirrored the curved shape of the ovipositor. The egg was extruded as the female slowly withdrew her ovipositor from the stem.

Under insectary conditions, 14 females laid an average of 6.8 ± 0.45 (range: 1–15) eggs per day. Oviposition occurred a mean number of 1.3 ± 0.12 (range: 0–4) times per week. These females laid a mean total of 32.4 ± 4.1 (range: 8–57) eggs during their lifetimes.

The mean longevity of 12 males was 38.7 ± 4.3 (range: 21–55) days compared to 50.5 ± 2.5 (range: 34–60) days for 12 females. In the field overwintered adults live an additional 3 to 4 months.

Seasonal history.—*Stobaera tricarinata* was bivoltine in Mill Canyon during 1977 and 1978. The F_1 generation occurred during June–August, followed by a second generation in October and November. The sex ratio of both generations approximated 1:1. The F_2 generation overwinters as adults with undeveloped gonads. No females with fully developed ovaries were found at the study site after October 31 during 1978. The fall (F_2) generations of nymphs and adults are more darkly pigmented than the summer (F_1) generations.

The overwintered females oviposited during active vegetative growth by western ragweed in April and May. A week interval occurred between the 2 generations in mid-September during 1977 and 1978, when 50 weekly sweeps of ragweed shoots with a standard sweep net yielded neither nymphs nor adults. The F_2 generation presumably was present as eggs at this time. Nymphs of the F_2 generation were collected from late September until mid-November during both years.

Parasitization.—The nymphs and adults of *S. tricarinata* in Mill Canyon were parasitized by a dryinid wasp identified as *Pseudogonatopus arizonicus* Perkins (Hymenoptera: Dryinidae). This dryinid has been reported from *Stobaera* sp. elsewhere; however, this was the first record for this parasite from southern California and from an identified host species (P. H. Freytag, pers. comm.). This parasite was most abundant in Mill Canyon during August.

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